New Viscosity Data for CuO-water Nanofluid -The Hysteresis Phenomenon Revisited

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Abstract. In the present work, we have experimentally investigated the stability and hysteresis behaviors of CuO-water nanofluid when submitted to a repeated heating and cooling process. Data has shown that for a low particle volume concentration, 1.6% in particular, the hysteresis phenomenon did not occur for the temperature range considered. For a higher particle concentration,

5% in particular, the hysteresis behaviour was clearly observed when fluid temperature exceeded 52ºC approximately. Beyond this critical temperature, the nanofluid viscosity has increased, and such an increase even continued with a decrease of temperature during the cooling phase. Subsequent measured viscosity and observations in laboratory after the first occurrence of the hysteresis phenomenon have confirmed that the alterations on the particle suspension and on the nanofluid stability appear indeed permanent. Such alterations were found to worsen with further heating/cooling cycles.

Conclusion

We have experimentally studied the stability and hysteresis behaviors of CuO-water nanofluid.

It was found that for the nanofluid with 1.6% particle volume fraction, the hysteresis phenomenon did not occur, and the effects due to the heating/cooling process, although present, seem to be slight.

For a higher particle concentration, 5%, the hysteresis behaviour was clearly observed when fluid temperature exceeded 52ºC approximately. Measured viscosity data and observations after the first occurrence of the hysteresis phenomenon have confirmed that the damages due to repeated heating/cooling cycles on the particle suspension and on the nanofluid stability appear indeed permanent. Such damages were found to become worsened with further heating/cooling cycle.

References